SD11
.S9R4
no.82-22
Dup

FOREST PEST MANAGEMENT
Pacific Southwest Region

Report No. 82-22

3430 Evaluation
June 24, 1982

BIOLOGICAL EVALUATION OF TREE MORTALITY ON THE ESPEE RIDGE SUGAR PINE PLANTATION, COVELO RANGER DISTRICT, MENDOCINO NATIONAL FOREST

Richard S. Smith, Jr., Forest Pathologist

PSW FOREST AND RANGE EXPERIMENT STATION
AUG 4 1982
STATION LIBRARY COPY

ABSTRACT

Branch flagging and tree mortality caused by white pine blister rust were found in a sugar pine plantation on Espee Ridge on the Covelo District. The level of infection in various parts of the plantation ranged from heavy to none. Due to this rust, heavy mortality will occur in the next decade in one small portion of the plantation, while chronic mortality will occur in the remaining part over the next 4 to 5 decades. Control options, including do nothing, sanitation, pruning, species change, and a combination of treatments, are discussed.

INTRODUCTION

On May 24, 1982, Dick Smith, FPM pathologist, and Floyd Barney, District Silviculturist, examined a sugar pine plantation on Espee Ridge in response to the District's request for a biological evaluation.

The Espee Ridge plantation is a 3 to 4 acre planting of sugar pine in which the trees range from 6 to 20 feet in height. It is surrounded by a mixed conifer stand containing natural sugar pine. The plantation is roughly L-shaped with one leg crossing over the ridge to lie on the north facing slope. Most of the plantation is on the south side of the ridge. A small meadow is in the southeastern end of the plantation. There are no streams in the immediate vicinity. The plantation is growing very well, was thinned once in the past, and appears in places

USDA, FOREST SERVICE, PACIFIC SOUTHWEST REGION
State and Private Forestry, Forest Pest Management
630 Sansome Street, San Francisco, California 94111

to be ready for a second thinning. Some areas of slow growth are evident adjacent to the older mixed conifer stand. Branch flagging and tree mortality caused by white pine blister rust were noted by the District this spring and a biological evaluation was requested of Forest Pest Management.

OBSERVATIONS

The plantation was walked through, and the trees were examined for the numbers, positions, and ages of white pine blister rust infections.

Infection Levels -- Three rather distinct levels of infection were found in four areas of the plantation. Moderate to heavy infection was noted in the small portion of the plantation on the north aspect. Here, most trees had numerous infections, many trees had lethal infections and some trees had already died from the rust. The trees on the upper portion of the south-facing slope and around the meadow were lightly infected. In these two areas an estimated 20-25% of the trees were infected, but with only one or two cankers per tree. Most cankers were prunable branch cankers. In the lower southern slope and on the flats no rust infection was found.

Canker Position and Age -- On the north-facing slope, both branch and bole cankers were found. These cankers were found to be of various age groups of six-years old, ten-years old, and older. They ranged from ground level to 15 feet high in the tree. On the south-facing slope, most cankers were prunable branch cankers found low in the tree. The majority of branch cankers were within 6 feet of the ground, a few were noted as high as 10 feet and one was about 12 feet high. Most cankers were found on 6-year-old wood and a few on 10-year-old wood. This indicates that all rust infection in this part of the stand occurred only during two favorable years, about 1976 and 1970.

The crowns of older natural grown sugar pine adjacent to the plantation were examined for branch flagging due to blister rust and none was seen. Shading and self-pruning had eliminated the lower portions of their crowns where conditions for infection were most favorable. No infection was seen in the remaining upper crowns.

BIOLOGY OF THE PEST

White Pine Blister Rust. This rust disease, caused by the fungus Cronartium ribicola, attacks sugar and western white pines and several species of Ribes. The fungus is an obligate parasite which must alternate between Ribes and white pines. Spores produced on the pine branch and stem cankers in the spring infect the leaves of Ribes. Spores produced on Ribes leaves in the fall infect the needles of white pines. The fungus grows from the pine needle into the branch, where it forms a canker. This process can take from 2 to 3 years. The branch cankers enlarge and grow toward the main stem. Those within 24 inches of the stem have a good chance of reaching the stem and causing a stem or bole

canker. Branch cankers cause branch flagging and in themselves are not very damaging to the tree. The real damage is done when the rust invades the main stem and causes a bole canker. Here the rust eventually girdles and kills the tree.

Rust infections in California occur most often in cool moist sites such as stream bottoms or around meadows. Temperature and moisture conditions are critical and must coincide with spore dispersal if infection is to occur. There are relatively few sites where these conditions occur frequently and infection takes place year after year. In most rusted sites, infection occurs only periodically when favorable conditions occur at the right time. These favorable periods of high infection are called wave years. 1976 was such a wave year. As one moves from the sites most favorable for rust to sites less favorable, the frequency of wave years decreases.

MANAGEMENT OPTIONS

The following management options and actions are approaches which the District may consider in resolving this pest problem. The environmental consequences of these options are described.

1. Do Nothing. Blister rust will kill all or most all the sugar pine on the north-facing slope before they become merchantable. In the upper south-facing slope and the meadow some mortality of the smaller trees with bole cankers will occur before they reach merchantible size (within the next ten years). The remaining infected trees (roughly 75% of the infected trees) should reach minimum merchantible size, but some should start dying in the second ten-year period. New rust cankers will continue to infect the lower crowns sporadically during favorable rust-years until shading and self-pruning of the lower 16 feet of the crown occurs. Some third and fourth decade mortality could result from these near-future cankers. The rust-free area of the plantation, the lower southern slope and the flats, should remain rust-free.

2. Sanitation Thinning. Either separately or in conjunction with an overall stand thinning, lethaly infected sugar pine (those pines with rust infections in the bole or branch cankers within 4 inches of the bole) should be removed from the stand. If this were done, most of the stand on the north facing slope and only a few scattered trees in the remainder of the stand would be removed. This option would not materially change the prognosis described in option 1, but it would remove the non-productive competing trees and release those trees with a better chance of reaching merchantible size.

3. Pruning. Pruning trees with no lethal cankers (bole cankers or branch cankers within 4 inches of bole) would accomplish two things. By pruning all branches from the ground up to 12-14 feet high in the larger trees and pruning to leave a 30% live crown ratio on smaller trees, all the current rust cankers on the larger trees and most of them in the smaller trees would be removed. This would greatly reduce if not eliminate the second decade's mortality which these current branch cankers

would cause. Secondly, since the conditions for rust infection are most favorable in the lower crown and no infection was noted over 12 feet high in the crowns, the removal of the lower branches would avoid and/or prevent future rust infection of the pruned trees. This would reduce and/or eliminate the projected third and fourth decade mortality described in the first option.

4. Species Change. The stand could be cut down, the site prepared for planting, and the area planted to ponderosa pine and/or Douglas-fir.

5. Combinations of the Above. The thinning, pruning, and species change options could be utilized together or separately in various portions of the stand to meet stand objectives with minimum cost. The heavily-infected portion of the stand on the north-facing slope could be cut and replanted to a resistant species. The remaining stand could be thinned to remove lethally infected sugar pine. And, the lightly infected portion of the stand on the upper south-facing slope and around the meadow could be pruned up 12 to 14 feet to remove current infection and prevent future infection. This should greatly reduce or eliminate rust-caused mortality in future decades.

Surveillance. -- With any option other than the Do Nothing, continued surveillance of the rust situation is highly desirable. If future infections of a part or all of the stand occur during a very favorable infection year, an early recognition of this rust situation would put the District and FPM in a much better position to resolve the problem and improve our chances of preserving the stand.